

From the INTERNATIONAL BUREAU

**PCT**NOTIFICATION CONCERNING  
TRANSMITTAL OF COPY OF INTERNATIONAL  
PRELIMINARY REPORT ON PATENTABILITY  
(CHAPTER I OF THE PATENT COOPERATION  
TREATY)

(PCT Rule 44bis.1(c))

To:

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JAPONDate of mailing (*day/month/year*)  
14 June 2007 (14.06.2007)Applicant's or agent's file reference  
O92**IMPORTANT NOTICE**International application No.  
PCT/JP2005/022506International filing date (*day/month/year*)  
01 December 2005 (01.12.2005)Priority date (*day/month/year*)  
02 December 2004 (02.12.2004)

Applicant

KABUSHIKI KAISHA OHARA et al

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO  
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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference O92	<b>FOR FURTHER ACTION</b>	See item 4 below
International application No. PCT/JP2005/022506	International filing date ( <i>day/month/year</i> ) 01 December 2005 (01.12.2005)	Priority date ( <i>day/month/year</i> ) 02 December 2004 (02.12.2004)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant KABUSHIKI KAISHA OHARA		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input checked="" type="checkbox"/> | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 05 June 2007 (05.06.2007)
Facsimile No. +41 22 338 82 70	Authorized officer  <b>Yoshiko Kuwahara</b>  e-mail: pt07.pct@wipo.int

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

8/6

## PCT

REC'D 26 MAY 2006  
WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY  
(PCT Rule 43bis.1)

Date of mailing

(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

### FOR FURTHER ACTION

See paragraph 2 below

International application No.  
PCT/JP2005/022506

International filing date (day/month/year)  
01.12.2005

Priority date (day/month/year)  
02.12.2004

International Patent Classification (IPC) or both national classification and IPC  
INV. H01M10/36

Applicant

KABUSHIKI KAISHA OHARA

### 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

### 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

### 3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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D-80298 Munich  
Tel. +49 89 2399 - 0 Tx: 523656 epmu d  
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Date of completion of  
this opinion

see form  
PCT/ISA/210

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**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/JP2005/022506

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ on paper
    - ☐ in electronic form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in electronic form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. II Priority**

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1. ☒ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43*bis*.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/JP2005/022506

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	4,5,7,10,11,14-21
	No: Claims	1-3,6,8,9,12,13
Inventive step (IS)	Yes: Claims	10,11,18,19
	No: Claims	4,5,7,14-17,20,21
Industrial applicability (IA)	Yes: Claims	1-21
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**Section V.2: Citations and Explanations**

(i) Example 3 of document EP 1 424 743 discloses the manufacture of a solid electrolyte battery via RF sputtering of glass-ceramic powder containing  $\text{Li}_{1+x+y}\text{Al}_x\text{Ti}_{2-x}\text{Si}_y\text{P}_{3-y}\text{O}_{12}$  (where  $0 \leq x \leq 1$  and  $0 \leq y \leq 1$ ) and lithium phosphate binder such as to form a thin film (0.1 micrometres) solid electrolyte on a Li/Al foil -ve electrode with a  $\text{LiCoO}_2$  +ve electrode on the other side of the solid electrolyte. Heat treatment at 550 °C restores the crystal nature of the solid electrolyte and positive electrode. Other direct coating techniques are also disclosed in this prior art as is the additional incorporation of the above type of materials into both the positive and negative electrodes of the solid electrolyte battery. The complete disclosure is clearly prejudicial to the novelty or inventive step of the subject matters of at least current claims 1-9, 12-17 and 20-21. Similarly, whilst the subject matter of current claims 10 or 11 (or 18 or 19) could provide for novel main claims, what contribution the presence of  $\text{Ga}_2\text{O}_3$  and  $\text{GeO}_2$  could make which could possibly justify acknowledging inventive activity has not been disclosed anywhere in the complete application.

(ii) The current main claims 1 and 12 only require that the "solid electrolyte .... is substantially free of an organic substance and an electrolytic solution". This does not exclude such substances from being in the battery itself or even being directly in contact with the solid electrolyte. With this in mind, the disclosure of US 2003/0224244 is highly prejudicial. Thus and despite the carbon fibre layers 3 of Fig. 1 thereof being impregnated with electrolytic solution, the solid electrolyte 4 itself is made of the same type of materials as disclosed in the current application. Particular attention is drawn to Example 1 as well as comparative example 1 which does not have the liquid electrolyte impregnated layer 3. The solid electrolyte disclosed is the lithium ion conducting glass-ceramic crystal material  $\text{Li}_{1-x+y}\text{Al}_x\text{Ti}_{2-x}\text{Si}_y\text{P}_{3-y}\text{O}_{12}$  and where  $0 \leq x \leq 0.4$  and  $0 \leq y \leq 0.6$  and has a conductivity of  $1.4 \times 10^{-3} \text{ S.cm}^{-1}$ . The complete disclosure is prejudicial to the novelty of the subject matters of at least current claims 1-3, 6, 8, 9, 12 and 13.

(iii) From its WPI abstract, JP2002109955 discloses a sulfide group crystallized glass for a solid electrolyte in a secondary battery, comprising 50-92.5 mol% of lithium sulfide ( $\text{Li}_2\text{S}$ ) and 7.5-50 mol% of phosphorus sulfide ( $\text{P}_2\text{S}_5$ ). The rate of crystallization of the crystallized glass is 30-99%. The crystal phase contains a compound comprising at least one kind chosen out of glass phase containing  $\text{Li}_2\text{S}$  and  $\text{P}_2\text{S}_5$ , and group containing  $\text{Li}_7\text{PS}_6$ ,  $\text{Li}_4\text{P}_2\text{S}_6$  and  $\text{Li}_3\text{PS}_4$ . The solid type electrolyte and the solid secondary battery formed using the

sulfide group crystallized glass, has excellent lithium ionic conductivity even at room temperature and certainly above that of the lower limit of current claim 8. (see Figs 2 and 4 of the JP patent). This is prejudicial to the novelty of at least current claims 1-3, 8 and 12.

(iv) As well as disclosing amorphous electrolytes, document US 6,165,646 discloses crystalline lithium ion conductive inorganic solid electrolytes such as  $\text{Li}_3\text{N}$ ,  $\text{Li}_{1.3}\text{Sc}_{0.3}\text{Ti}_{1.7}(\text{PO}_4)_3$  and  $\text{Li}_{0.2}\text{La}_{0.5}\text{TiO}_3$  and indicates these to be suitable for secondary lithium batteries. This is prejudicial to the novelty of at least current claims 1-3 and 12.

(v) Documents US 2004/0081891 and US 2003/0142466 disclose other solid inorganic crystalline electrolytes which are conductive for lithium ion and designed for use in secondary lithium ion batteries. These include the materials  $\text{LiI}$  and  $\text{Li}_3\text{N}$  [US '891] and  $60\text{LiI}-40\text{Al}_2\text{O}_3$ ,  $\text{Li}_3\text{N}$ ,  $50\text{LiI}-40\text{Li}_2\text{S}-20\text{P}_2\text{S}_5$ ,  $\text{Li}_3\text{N}-\text{LiI}$ ,  $\text{Li}_3\text{PO}_4$ ,  $\text{Li}_4\text{SiO}_4$  and  $x\text{Li}_3\text{PO}_4-(1-x)\text{Li}_4\text{SiO}_4$  ( $0 < x < 1$ ) [US '466]. Both these documents also contemplate using these solid electrolytes along with electrically conductive material within the anode and/or cathode of such cells. The complete disclosures are such as to be prejudicial to the novelty or inventive step of current claims 1-8, 12-17 and 21.